

Climatic effects on biomass accumulation and proteins in relation to bud proliferation in some gymnosperms

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The forest cover is of paramount importance for the society to protect the environment in various ways. Silviculture has paid considerable attention towards gymnosperms due to their economic importance. The number of living gymnosperms in the world approximately number 70 genera and 725 species, widely distributed in the cold climates of temperate as well as in the dry and arid condition of the tropics. Among all the gymnosperms, conifers form the most conspicuous group growing as evergreen woody trees or shrubs and consist of 51 genera and approximately 550 species. Conifers as a group have a very wide range of adaptability with respect to latitude, altitude, temperature, season and humidity. While some of them grow optimum at relatively low temperature, other flourish at high temperature associated with so many factors. Many are able to tolerate frost injuries and therefore survive in cold temperate and subarctic regions.

The search for novel high quality but cheap source of timber and other forest product has continued to be a major concern in many parts of the developing world. Conifers are of great importance in providing timber and wood pulp and constitute major forest wealth. Their timber is cheapest and the best. The world's important soft woods are also coniferous species. Besides this, these are good source of fatty and essential oils, which are used in perfumery and in medicines. Their most remarkable contribution is providing a cool and soothing climate, which is very suitable for health.

In India members of conifers (except *Podocarpus*) are restricted to Himalayan region. Additionally a large number of exotic conifers are cultivated as ornamental plants among which *Araucaria* attained higher rank. Other native conifer is *Podocarpus* growing wild in Nilgiris and Andaman islands. Both *Araucaria* & *Podocarpus* are source of quality timber used in plywood and indoor works. Due to their fine texture, beautiful foliage and stately appearance these trees find a prominent space in landscaping.

The fast vanishing timber varieties in the country need to be investigated extensively. Thus it is of paramount importance to study the mechanism of growth behaviour of these gymnosperms in relation to changing climatic conditions. Hence, estimation of biomass accumulation and proteins in *Araucaria* the exotic species (*A. cookii* & *A. cunninghamii*) and *Podocarpus* the native species (*P. neriifolius* & *P. gracilior*) is now attempted. Present research was undertaken in the year 1995-1997 during that it was investigated how proteins and biomass accumulation as a physiological function play a crucial role for growth & developmental process in such trees especially their out of forest management, growing at Botanic Gardens, Punjabi University, Patiala (PATPU). For any exotic tree species growing in changing climatic conditions, the fundamental requirements for its survival is the better *adaptability* & adjustability as well as maintaining *efficient energy management* required for the processes leading to maturation of reproduction of reproductive structures.

Sharp correlations with bud proliferation and biomass accumulation, storage as well as other proteins existed in all the species of *Araucaria* and *Podocarpus*. Rhythmic growth in *A. cookii* and *P. neriifolius* was noted predominately while it remained restricted to seasonal fluctuations in others presenting adjustments to the extreme temperatures prevailing at PATPU. Our data showed that biomass accumulated only during non-growing seasons while its consumption was noted in

active growth periods concomitantly due to their rapid depletions. Maximum biomass production was noticed from autumn to winters which went to its lowest ebb during spring and late summer in all the four species. Proteins demonstrated a parallel relationship with growth activities but oppositely acted upon the biomass accumulations.

In all the four species a winter decline sets in because of onset of abscissions when at sub cellular level the vegetative storage proteins (VSP) increased presenting their relationship to combat the winter injuries and summer desiccations. The rhythmicity in biomass production and its mobilization in *P. nerifolius* suggest its role in switching from vegetative meristematic growth to meiotic configurations resulting in the production of male cones twice during the year round growth cycle. VSP and biomass increased substantially during cone development, followed by their trapping into thermogenesis probably due to their involvements in building process for converting metabolic energy into the process leading to maturation of reproductive structures. The failure of buds to switch over to reproductive status in both species of *Araucaria* and *P. gracilor* is likely to be attributed to the inadequate internal metabolic balance operating to production of biomass which appears to be incongruous with growth requirements. Thus, the present study provides a consolidated picture of some existing native and exotic gymnosperms as a good biomass resources and forest wealth of the country.

Key words: *Araucaria*, *Podocarpus*, Biomass, Proteins, Thermogenesis, Bud Proliferation.